APPENDIX B

Air Quality

Air Quality Appendix B-1
for
Baja California Power, Inc.
Energía de Baja California
Energía Azteca X

Appendix B-1: BCP Air Quality Modeling Analysis

I. Technical Description

The BCP transmission line would be connected to the La Rosita Power Complex (LRPC), which consists of four natural gas fired combustion turbines with associated heat recovery steam generators (HRSG) and two steam turbine generators. The LRPC is located in Mexicali, Baja California, Mexico, approximately 3 miles south of the US-Mexico border. Two of the four LRPC combustion turbines will generate a nominal 560 MW of power for export to the U.S. One combustion turbine is owned by Energía de Baja California, S. de R.L. de C.V. (EBC), and the other turbine is owned by Energía Azteca X, S. de R.L. de C.V (EAX). EAX also owns the remaining two combustion turbines that will supply power to the Comisión Federal de Electricidad (CFE) under a 25-year power purchase contract.

All four LRPC combustion turbines are Model 501F machines provided by Siemens-Westinghouse (SW). The SW machine utilizes dry, low-NO_X combustion technology to reduce emissions of nitrogen oxides (NO_X). Additionally, two of these units will be fitted with selective catalytic reduction (SCR) technology that will further reduce the emissions of NO_X from these units to a level of approximately 4 parts per million (ppm). These emission levels are well below the Mexican standards (*Norma Oficial Mexicana – 085*) of 139 ppm. In addition, these emission levels are below the latest guidelines for new power plants published by the World Bank in July 1998, which sets the limit at 155 ppm. The LRPC generation facilities will run exclusively on natural gas. The CO emissions from each of the LRPC turbines is 25 ppm.

The Project will, in accordance with specific Mexican requirements (*Norma Oficial Mexicana -- 037*), be required to operate with a continuous emissions monitoring system (CEMS) that gives real-time data on emission rates to verify that the standards are in fact being met. In addition, the project will operate a network of ambient air quality monitoring stations to be designed in conjunction with local authorities that will enhance their existing air quality monitoring systems and provide valuable information for the communities in the area relative to ambient air quality.

EAX and EBC are located on sites immediately adjacent to each other, forming the La Rosita Power Complex. The three EAX turbines are being constructed as a result of an international solicitation by the Comisión Federal de Electricidad (CFE), Mexico's national electric utility, for a power generation facility. The generation capacity of the three EAX turbines is a nominal 750 MW.. Only one of the units operated by EAX will export power to the U.S. The other two EAX units will provide power to CFE.

II. Air Dispersion Modeling Methodology

While the combustion technology is highly efficient and produces fewer emissions per unit of generation than technologies using other fuels, such as fuel oil or coal, the impacts on air quality require a detailed analysis to ensure that all regulations are met and that no negative health impacts are generated. Because the generation facility will not be located within the United States, U.S. Environmental Protection Agency (U.S. EPA) environmental standards do not apply. Nonetheless, BCP and its affiliates voluntarily incorporated U.S. EPA guidelines for dispersion modeling into the Air Quality Impact Assessment (AQIA) performed for the generation facility. The AQIA presented here was developed for the two export units.

Air quality impact assessments typically have the following steps:

A. Definition of existing concentrations of specific pollutants in the area of interest
B. Estimation of emissions from the project
C. Dispersion modeling to estimate the increase in ambient concentration of the specified pollutants resulting from the project emissions

Each of these steps has been performed for the generation facilities.

II.1. Definition of existing concentrations of specific pollutants

Background concentration levels were available from monitoring stations that are operated by the U.S./Mexico Border Information Center on Air Pollution, a center run under the auspices of the U.S. EPA. Mexicali data for 1997-1998 were used to determine the background concentration levels, along with data obtained from the U.S. EPA in the United States in the border region. Table B-1.1 shows the background levels obtained.

TABLE B1.1
Imperial County Maximum Background Levels
(micrograms per cubic meter)[1]
*All maximum concentrations occurred at Calexico Ethel Street monitoring site.

Averaging Period	NO_2 *	CO *	PM_{10} *
1-Hour	483.2 (1998)	36480 (1995)	----
8-Hour	----	26140 (1995)	----
24-Hour	----	----	568 (1998)
Annual	29.7 (1995)	----	109.8 (1996)

1 Based on Cal-EPA/Air Resources Board *California Ambient Air Quality Data 1980-1998* CD-ROM, December 1999. Values shown represent the maximum values for several air stations located in Calexico, El Centro, Niland and Westmoreland during the 1992-1998 monitoring period. Original values in parts per million were adjusted using *AP-42, Appendix A* factors.

II.2 Estimation of Emissions

The estimated project emissions were calculated based on data from the combustion turbine and heat recovery steam generator vendors. The following table summarizes the dispersion modeling stack parameters during maximum load operations, including duct-firing of the HRSG.

Table B2: Atmospheric Dispersion Modeling Stack Parameters

Turbine Type	Stack Height (m)	Stack Diameter (m)	Stack Temperature (C)	Exit Velocity (m/s)	Emission Rates per turbine (g/s)		
					CO	NO_2	PM_{10}
EAX (gas, combined cycle)	56	5.49	85	21.56	15.16	3.1	6.17
EBC (gas, combined cycle)	56	5.49	85	21.56	15.16	3.1	6.17

II.3 Dispersion Modeling

A dispersion modeling analysis was performed using the U.S. EPA's Industrial Source Complex Short-Term 3 (ISCST3) model (Version 00101). The ISCST3 model is a steady state, multiple-source, Gaussian dispersion model and is applicable for estimating ambient impacts from point, area, and volume sources out to a distance of about 30 miles (50 kilometers), and includes algorithms for addressing building downwash influences, dry and wet deposition, and complex terrain. The ISCST3 model includes many options to address unique modeling requirements. Some of these options are discussed below, and the options chosen for analyses performed for this proposed project are identified.

ISCST3 incorporates simple terrain algorithms for estimating impacts at receptors where ground-level elevations are equal to or less than the heights of the emission sources (stacks). To estimate impacts at receptors with ground-level elevations that exceed the final plume height centerline, the ISCST3 model incorporates complex terrain algorithms from the COMPLEX-I model. In default mode, the model follows U.S. EPA's guidance for calculation of impacts in intermediate terrain, that is, where ground-level elevations are located between the emissions release height and the final plume height centerline. For intermediate terrain receptors, the ISCST3 model calculates concentrations using both simple terrain algorithms and complex terrain algorithms. The model then compares the predicted concentrations at each receptor, on an hourly basis, and the highest concentration per receptor is output from the model. The results presented were derived from using all three terrain algorithms.

The technical options selected for the ISCST3 modeling are listed below. These are referred to as the regulatory default options in the ISCST3 Users Guide. The input options for ISCST3 are as follows:

- Final plume rise
- Buoyancy-induced dispersion
- Stack tip downwash
- Rural dispersion coefficients
- Calm processing routine
- Default wind profile exponents (rural)
- Default vertical temperature gradients
- Anemometer height = 10 meters.

II.3.1 Meteorology

The meteorological data set deemed most representative of the Mexicali-Calexico region was five years (1990-1994) of hourly surface meteorological data collected at Imperial, California, with Holzworth seasonal average mixing height data (CARB, 2001a; Holzworth, 1972). The Imperial meteorological data set is from the National Weather Service through the CARB archives.

II.3.2 Receptor Grids

A Cartesian receptor grid was used in the modeling analysis. The receptors extend to a distance of approximately 12 kilometers from the proposed turbine source. Beginning at the facility and moving outward, receptors were placed at 250 meter, 500 meter and 1,000 meter increments.

A refined receptor grid with 50-meter grid spacing was placed near at the border in an area where elevated concentrations were predicted. Placing a grid with 125-meter spacing around these points further refined the locations and maximum concentrations at locations south of the border.

In addition to the regularly spaced receptor grids, UTM coordinates corresponding with the ambient air quality monitoring stations were set up as receptor points in order to evaluate impacts at the locations of maximum background air pollution. Since the ambient air monitoring stations are located in generally more densely populated areas, this was done in order to compare the maximum predicted concentrations with the overall maximum predicted concentrations elsewhere on the receptor grids.

III. Results and Conclusion

The Mexican Government and U.S. EPA have developed ambient air quality standards for several pollutants (referred to as "Criteria Pollutants"). These pollutants include nitrogen dioxide, carbon monoxide and particulate matter less than or equal to10 microns in aerodynamic diameter (PM10). If measured or predicted concentrations of the criteria pollutants are below the ambient standard, no health effects are expected. According to the ISCST3 model, the predicted increase in concentration levels of the generation facilities' emissions would not, when added to existing background levels, exceed any of the threshold safety levels established by the Mexican Government. The attached isopleth plots (Figures B1 through B5) of the model results show that the maximum impacts will occur in Mexico in areas of elevated terrain. Impacts decrease in the direction of the border and continue to decrease as the plume moves north into the United States.

The regulatory jurisdiction of the U.S. EPA does not pertain to air pollutant emissions in Mexico; nevertheless, a useful benchmark found within U.S. EPA air permitting regulations and permitting guidance can be drawn upon to help assess the significance of these predicted increases from Mexican sources at the U.S. border and points north. In the context of permitting a major source or major modification in the U.S., the U.S. EPA has established significance levels (henceforth SLs) for the criteria pollutants NO2, SO2, and PM10 below which a major source or modification in the U.S will not be considered to cause or contribute to a violation of a NAAQS at any locality that does not meet NAAQS (40 CFR 51.165). In addition, U.S. EPA permitting guidance describes the impact area required air quality analysis to be a geographical area that exceeds these SLs. Where air dispersion modeling is performed, the U.S. EPA does not require a full impact analysis when emissions of a pollutant from a proposed source or modification would not increase ambient concentrations by more than these prescribed SLs. Thus SLs may be generally regarded as thresholds of impact below which impact is not viewed to be significant.

The combined increased pollutant concentrations resulting from emissions from the EBC and EAX export turbines are shown in Table B-1.3 (in micrograms per cubic meter). As can be seen, the pollutant levels at the U.S./Mexico border would still be well below U.S. EPA's SL thresholds. For example, the annual level of nitrogen dioxide in the U.S. receptor grid areas affected by the generation facilities tied to the proposed transmission line will be 0.15 μg/m3; the SIL for nitrogen dioxide is 1.0 μg/m3. The one-hour increase in carbon monoxide concentration levels in the U.S. will be 24.6 μg/m3; the SL is 2,000 μg/m3. For particulate matter, the 24-hour increase will be 1.7 μg/m3; the SIL is 5.0 μg/m3. The annual average increase of particulate matter will be 0.30 μg/m3 compared to an SL of 1.0 μg/m3. Thus, none of the increased concentration levels will exceed the U.S. EPA's SL.

Table B-1.3. U.S. EPA Significance Levels, Mexican Standards, and Power Generation Facilities Project Dispersion Modeling Results (micrograms per cubic meter)

Pollutant	Averaging Period	Mexico Standard	Significance Level (SL)	Concentration Increase –U.S. Receptors
Nitrogen dioxide	1-hour	395 $\mu g/m^3$	N/A	4.72 $\mu g/m^3$
Nitrogen dioxide	Annual	N/A	1.0 $\mu g/m^3$	0.15 $\mu g/m^3$
Carbon monoxide	1-Hour	N/A	2,000 $\mu g/m^3$	24.6 $\mu g/m^3$
Carbon monoxide	8-Hour	12,595 $\mu g/m^3$	500 $\mu g/m^3$	10.7 $\mu g/m^3$
Particulate matter	24-Hour	150 $\mu g/m^3$	5.0 $\mu g/m^3$	1.7 $\mu g/m^3$
Particulate matter	Annual	50 $\mu g/m^3$	1.0 $\mu g/m^3$	0.10 $\mu g/m^3$

All predicted concentration increases in the U.S. assessed at distinct points along the U.S./Mexico border and at points north of the U.S. border are below the SILs. Thus, no significant degradation of air quality is expected to occur at or north of the U.S. border as a result of the generation facilities associated with Baja California Power, Inc.'s transmission line.

1 hour NO_2

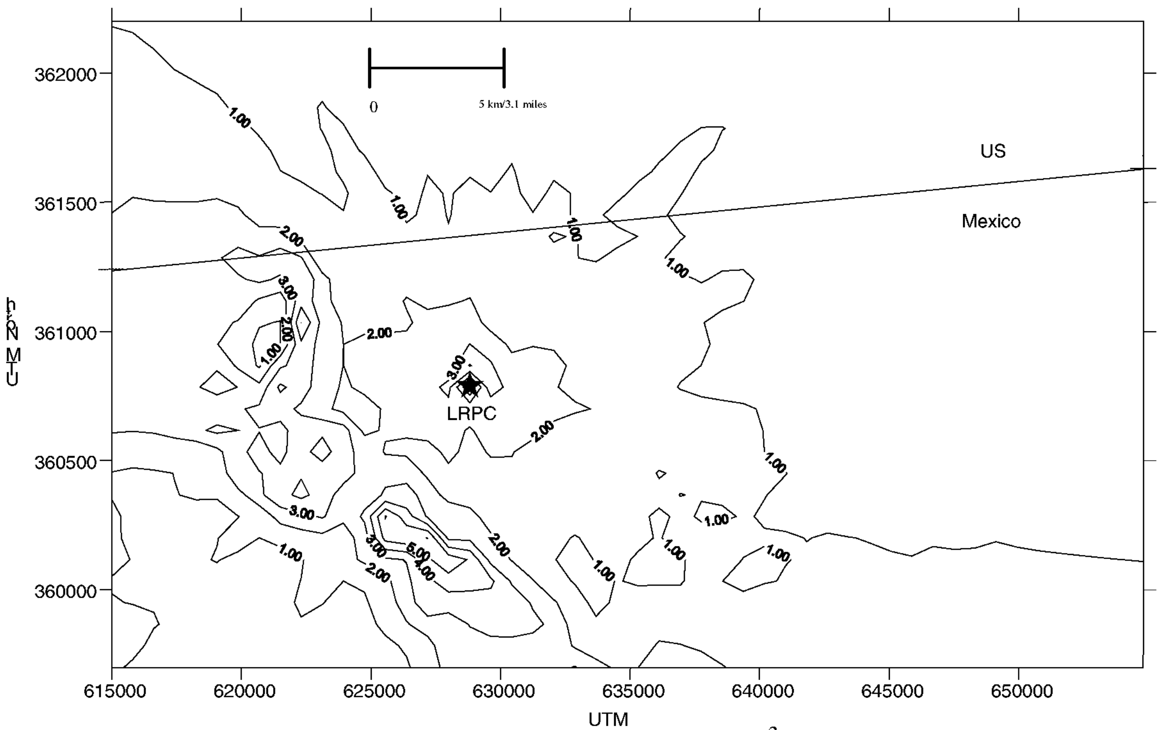

Figure B1: One hour NO_2 Isopleth ($\mu g/m^3$) SL: N/A

Annual NO_2

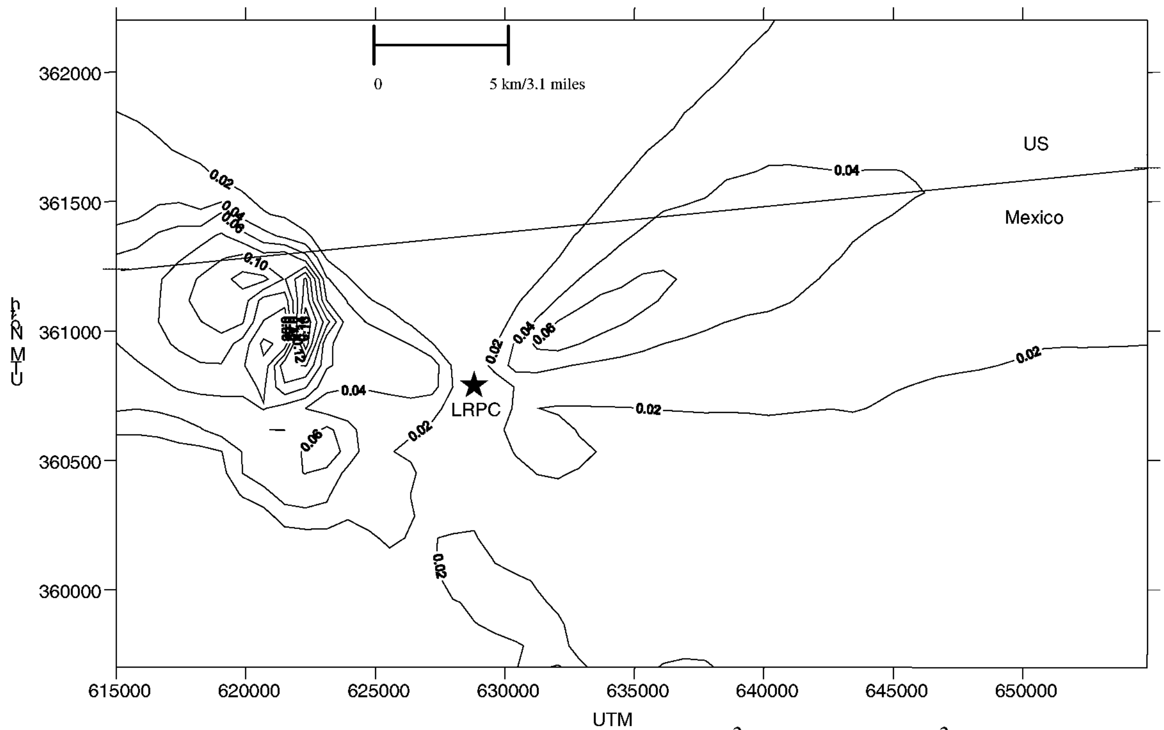

Figure B2: Annual NO_2 Isopleth ($\mu g/m^3$) SL: 1.0 $\mu g/m^3$

24 hour PM_{10}

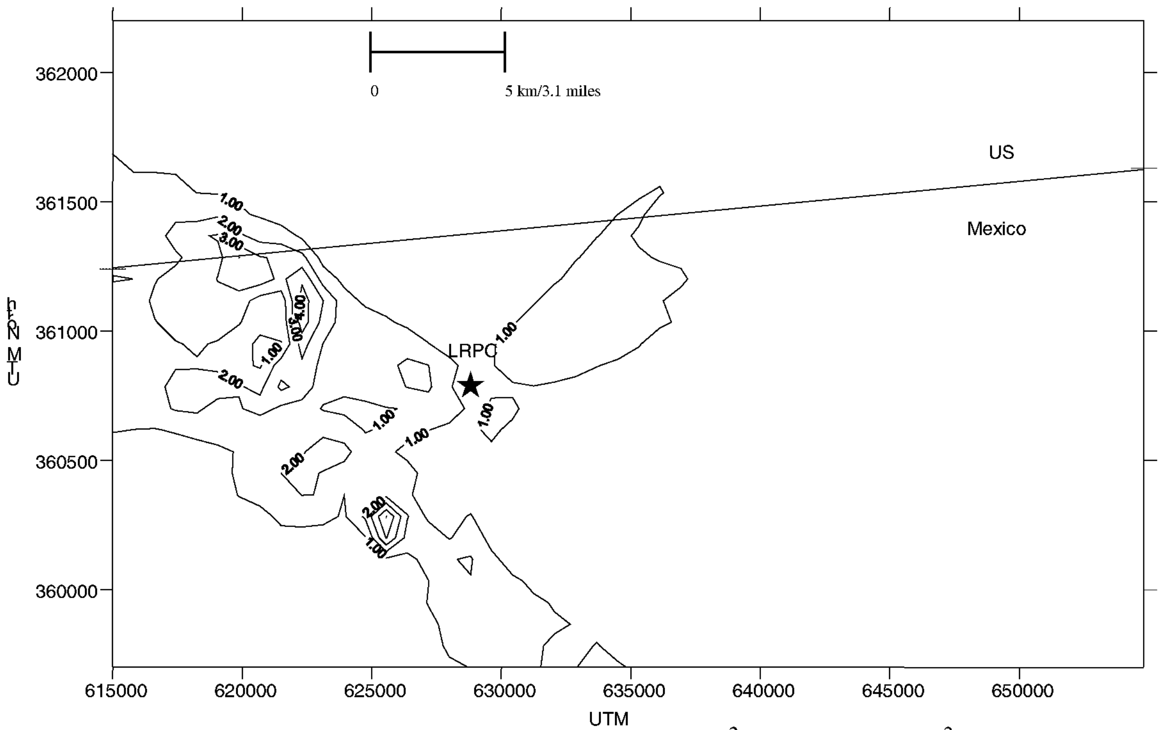

Figure B3: 24-hour PM_{10} Isopleth ($\mu g/m^3$) SL: 5.0 $\mu g/m^3$

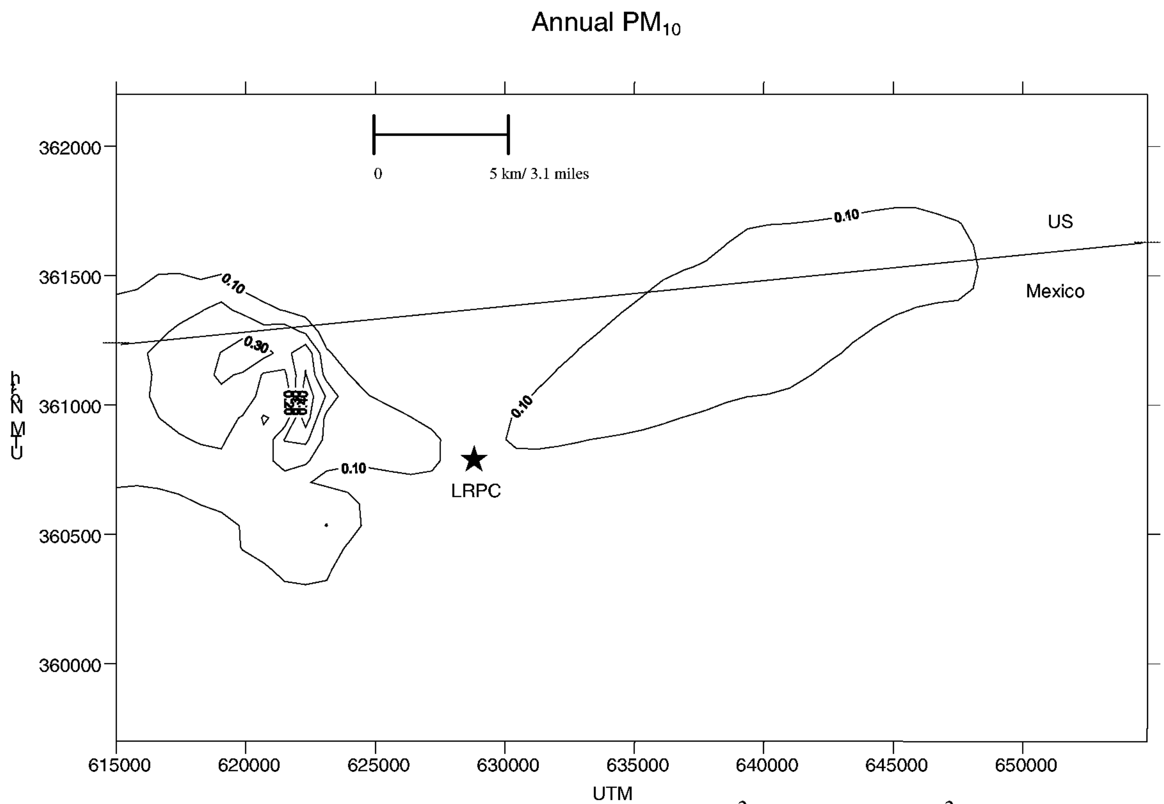

Figure B4: Annual PM_{10} Isopleth ($\mu g/m^3$) SL: 1.0 $\mu g/m^3$

1 hour CO

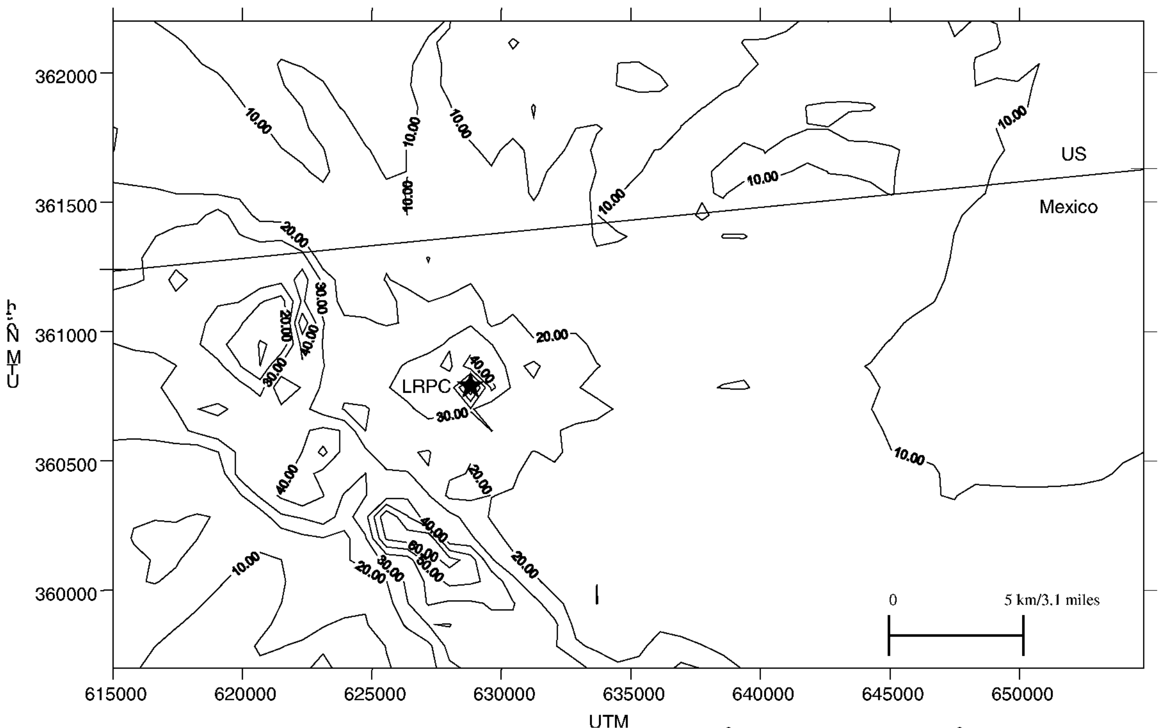

Figure B5: One-hour CO Isopleth ($\mu g/m^3$) SL: 2000 $\mu g/m^3$